How to cope(pod) with a multistressor environment?

Deschutter Yana[1], Everaert Gert[2], De Schamphelaere Karel[2] and De Troch Marleen[1]

[1] Marine Biology Research Group, Faculty of Sciences, Ghent University, Krijgslaan 281 - S8, 9000 Ghent, Belgium
E-mail: Yana.Deschutter@ugent.be

[2] GhEnToxLab, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, 9000 Ghent, Belgium

The rapidly expanding human population and associated pressure on the climate and the environment are leading to multiple disturbances in marine ecosystems worldwide. Climatic change leads to physical stressors such as changes in sea water temperature, salinity, and pH, while dissolved nutrients and pollutants in the marine ecosystem are important chemical stressors resulting from human activities. There is still a lack of quantitative data and understanding on how these chemical stressors and stressors resulting from climate change interact in marine ecosystems. To guarantee a sustained biodiversity and ecosystem functioning in the future, the understanding of the relative importance of the main drivers of change within marine ecosystems is crucial.

Our study aims to get better insight in the relative contribution of various environmental drivers to changes at the base of the pelagic food web in the Belgian Part of the North Sea (BPNS). In the framework of LIFEWATCH monthly sampling campaigns were conducted at twelve stations within the BPNS and the Belgian harbors from February 2015 to February 2016. Zooplankton samples were collected and environmental variables such as sea water temperature, salinity, pH, chlorophyll a concentration, nutrient concentrations and a selected set of priority pollutants were measured at each site. The samples are being analyzed through a multimethodological approach including stereomicroscopic identifications combined with Zooscan analysis, fatty acid profiling and toxicological measurements.

Generalized additive modelling (GAM) in R was used to determine the main drivers of change in the abundance and distribution of the dominant copepod species Temora longicornis and Acartia clausi. T. longicornis and A. clausi show different dynamics in their spatial distributions and abundances and appear to be driven by different factors. By means of GAM we succeeded to explain a large proportion of the variability in both species. When optimized, these GAM will provide important tools to identify and quantify the relative contribution of multiple stressors on zooplankton species within the BPNS. The developed models will be validated in controlled lab experiments with selected zooplankton species, providing for possible model species to be used as bio-indicators in the future.

Keywords: multiple stressors; zooplankton; generalized additive modelling